BEAVER MANAGEMENT STUDY

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ABSTRACT

After a nearly 200 year absence, beavers are back. While they are instrumental in creating and expanding wetlands, they are often at odds with humans.

Flow devices, which are beaver dam pipes or culvert protective fences, have been suggested as a solution to this problem. To evaluate this claim, management studies were made of 213 problematic beaver colonies. The results of these studies strongly support the contention that beaver-related flooding issues can usually be managed in a cost-effective, long-term manner with flow devices.

BACKGROUND

The North American beaver (*Castor canadensis*) is an important "keystone" species because the wetlands it creates by damming small order streams support a myriad of species. In addition, beaver-created wetlands have many other values including: groundwater recharge; decreased erosion; reduction of waterborne particles, excessive nutrients and toxins; decreased downstream flooding; and maintenance of downstream flows during dry periods.

Occasionally, beaver dams cause flooding of infrastructures such as roads, septic systems, homes, farms, or other developments in low lying areas. The traditional conflict resolution method has been trapping to remove the beavers. Frequently, the result is significant wetland loss, which creates its own problems.

As a result, decades ago wildlife officials and others began experimenting with flow devices to control beaver damming. Flow devices are either pipes through beaver dams to control water levels, or fences to prevent damming on road culverts.

Unfortunately, these flow devices were not usually effective because beavers were able to detect their presence and usually dammed them. In Massachusetts, the devices were effective only 4.5% of the time (MA Division of Fisheries and Wildlife). In New York a similar 3% success rate was reported (NY Dept. of Natural Resources). Due to these disappointing success rates, flow devices were generally considered a poor beaver management tool. Trapping remained the primary method of beaver control.

Improved flow device designs were reported in 1994 by the Clemson University group (Wood, et. al.) on 30 Clemson Pond Leveler pipe installations. Eighteen "beaver deceiver" devices were installed on Penobscot Nation lands in Maine (Lisle). In addition, over the past two decades, Michel LeClair installed over 100 flow devices at Gatineau Park in Ottawa, Canada. While these flow devices have been effective, the data on them is unpublished.

This study is intended to evaluate a large number of the newer flow devices to determine their role in modern beaver management.

METHODS

All flow devices were located in New England or New York. The majority (96%) of the beaver conflict sites evaluated are located in Massachusetts. The author and/or his partners were directly involved with every flow device installation.

All flow devices studied were installed between November, 1998, and November, 2002, with an average installation time of 23 months. Site visits for data collection were done an average of three times annually per conflict site (range: 1 - 6 visits annually). Data collection was the responsibility of the author.

Beaver trapping was done with Hancock or Bailey traps. Road and railroad culverts were beaver-proofed with Trapezoidal Culvert Protective Fence (see Figure 1) wherever feasible. Flexible Pond Leveler devices (see Figure 3) were used to control high water levels. Two types

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of problems encountered from beaver dams were blocked road culverts or dangerously high water levels.

DATA

A total of 213 problematic beaver colonies were evaluated in this study. Trapping was the only intervention for 36 (17%) of the problematic colonies and flow devices were used to manage 177 (83%) of the colonies. There were 277 total conflict sites from the 177 colonies were flow devices were installed, consisting of 116 free-standing dams and 161 dammed culverts.

Of the 116 problematic beaver dams where Flexible Pond Levelers are installed to resolve flooding problems, 95 (83%) are effectively controlling water levels. The failures were: 15 (13%) new downstream dams; 4 (3%) insufficient pipe capacity, and 1 (1%) vandalism. The average number of Flexible Pond Levelers needed per dam was 1.4, at a total cost of $910. The expected effective life of each device is at least 10 years, with an average maintenance time per site of 0.5 hours per year. Including a maintenance cost of $50 per year, the annualized cost per dam is $141.

There were 161 sites where Culvert Protective Fences were used to prevent beaver damming in culverts. Early in the study, cylindrical fences were installed on 30 culverts. However, due to 9 failures (30%), this design was abandoned. The remaining 131 culverts are protected with upright trapezoidal or rectangular culvert fences which are effectively preventing beaver damming of 126 (96%) culverts. The 5 failures were due to: 2 dammed fences; 2 maintenance not performed; and 1 new downstream dam.

At 42 of the 131 culvert sites, some ponding was tolerable so Flexible Pond Levelers were combined with culvert protective fences to maximize wetland acreage and protect human property. Including the 42 sites where Flexible Pond Levelers were combined with culvert protective fences, the average cost was $654. The expected effective life of each device is at least 10 years, with an average maintenance time per site of 1 hour per year. Including an average maintenance cost of $125 per year, the annualized cost per culvert is $190.

DISCUSSION

Flexible Pond Leveler

We installed Flexible Pond Leveler pipes to control water levels at 116 free-standing beaver dams. (See Figure 1). As the data demonstrates, these pipe systems resolved the conflict 83% of the time. Of the failures, three quarters were the result of new beaver damming downstream of the installation site. Often this was seen in manmade channels of uniform width. The uniformity of the manmade channel offered the beavers countless opportunities for new dam construction.

Like the Clemson Pond Leveler, the Flexible Pond Leveler design eliminates detectable water flow at the intake, so beavers do not dam the device and floating debris is not held against the fencing. As a result, maintenance on these pipe systems is negligible. We recommend the devices be checked once annually in the spring to ensure there is no

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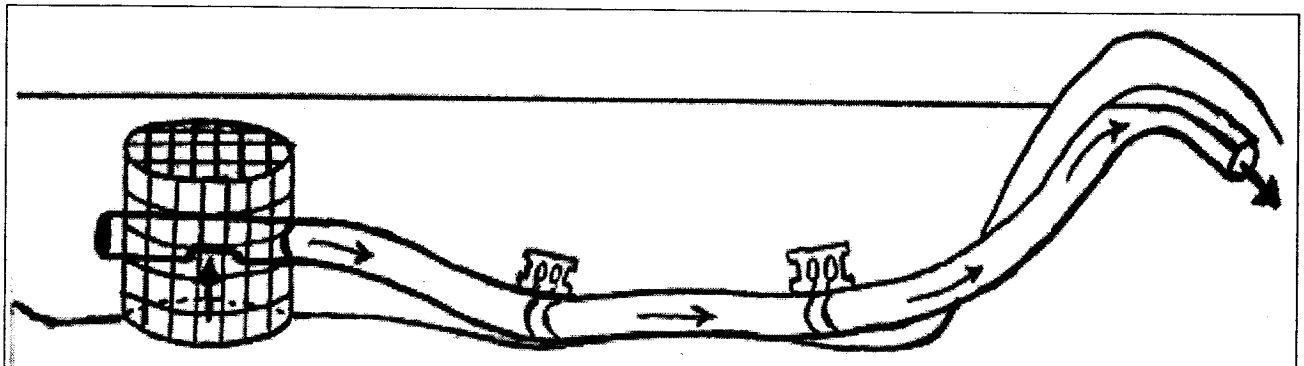

FIGURE 1
FLEXIBLE POND LEVELER

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winter ice damage. No other maintenance is typically needed.

Most failures were due to new beaver dams. If the water level was lowered more than one foot, or if there was a uniform, manmade channel, there was an increased risk of new damming. Lowering the pond level only as much as is necessary to prevent property damage minimizes the risk of the beavers building new problematic dams. This approach also maximizes the preserved wetland acreage. See Figure 2 for results.

Culvert Protection Fence

A culvert under a road probably appears as a hole through a dam to a beaver. For a relatively small amount of work, beavers can create a large pond by plugging a culvert. As a result, culverts are common damming sites for beavers. This study demonstrates that properly designed culvert protection fences (see Figure 3) are an extremely cost effective beaver management tool due to their high success rate, relatively low installation cost, and low need for maintenance. In addition, due to the low cost of a culvert protection relative to the potential high cost of repairing a flood damaged culvert, road bed or road, a compelling case can be made that they should be installed on any culvert where beaver damming is a risk. See Figure 4 for results.

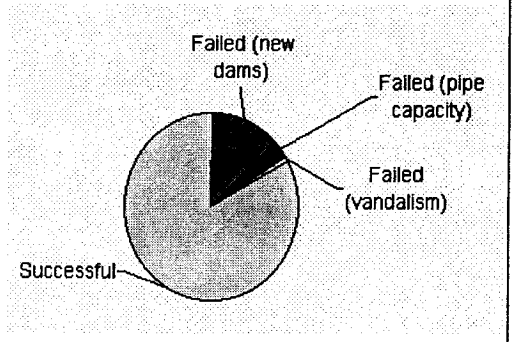

FIGURE 2
FLEXIBLE POND LEVELER RESULTS

Improving Success Rates

Of the 177 beaver colonies where flow devices were used, there were 277 conflict sites, an average of only 1.56 conflict sites per beaver colony. This low number is especially noteworthy because a single beaver colony can create ponds over a 0.5 mile stretch of stream and Massachusetts is the fourth most densely populated state in the nation.

However, of the 36 sites where flow devices were not recommended, there were often multiple actual or potential conflict sites. Therefore, a thorough assessment for potential upstream or downstream conflicts should be done prior to using flow devices.

Since the vast majority of problematic beaver colonies create less than two conflict dams, if beaver damage can be controlled at these few sites, large sections of a watershed can be protected. This management approach maximizes beaver created wetland acreage and prevents conflicts with humans.

Further analysis of the data reveals that, of the small percentage of beaver conflict sites where flow devices were ineffective, over half of those flow devices failed during the first twelve months of this study. Most of these failures were due to inexperience of the installers, poor site selection, and/or design experimen-

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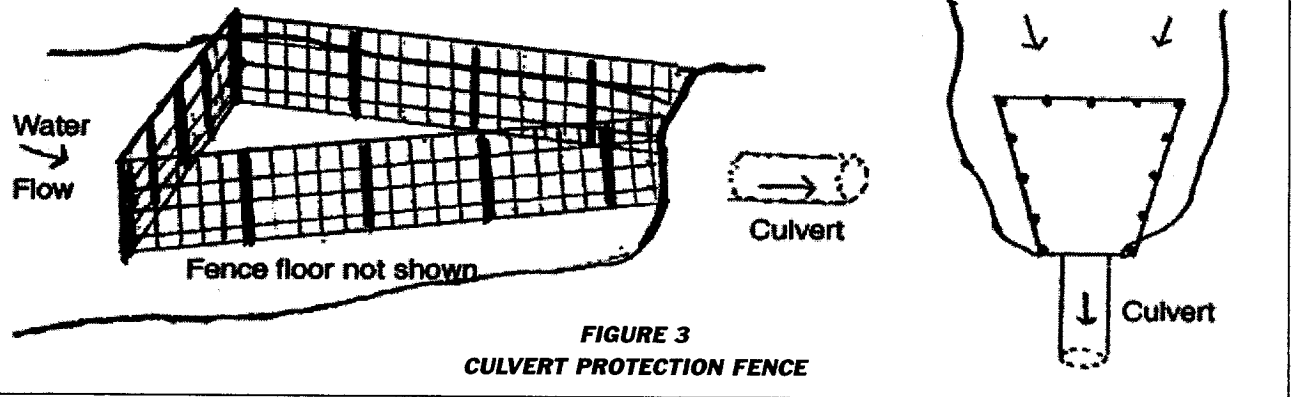

FIGURE 3
CULVERT PROTECTION FENCE

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tation. It therefore appears that this study underestimates the potential effectiveness of these devices in experienced hands.

Costs

A typical beaver colony will build a series of dams impounding many acres of wetlands. The total wetland acreage impounded by the dams reflects the topography of the area. In regions with low relief such as Minnesota, beavers might flood as much as 13% of the landscape, whereas in Maine only 1.5% of the landscape was modified (Lisle 2001). Using GPS technology, Lisle also calculated the wetland acreage created by a beaver colony at 6 sites with flow devices in Maine. In his study, the average beaver colony created and maintained 18.5 acres of wetlands (Lisle 2001). This estimate is comparable to our informal estimates of the beaver-created wetland acreage in this study. Using this information means that the 155 beaver colonies that were effectively managed with flow devices resulted in saving nearly 3,000 acres of beaver restored wetlands.

The annualized cost to install and maintain these devices approximately $14/wetland acre/year. This low annualized cost compares extremely favorably to the cost of other wetland restoration projects, and pales in comparison to the economic benefit of these wetlands to humans. This study strongly supports the increased utilization of these technologies to reclaim historic inland wetland acreage where conflicts with humans occur.

Future research

In our experience, if a flow device failed, it usually failed within the first month or two of the installation. Nearly all the devices in this study have been functioning significantly longer than two months so we do not expect to see the flow device effectiveness rate drop significantly over time. Nonetheless, we plan to continue to monitor these sites and publish updated findings in the years to come.

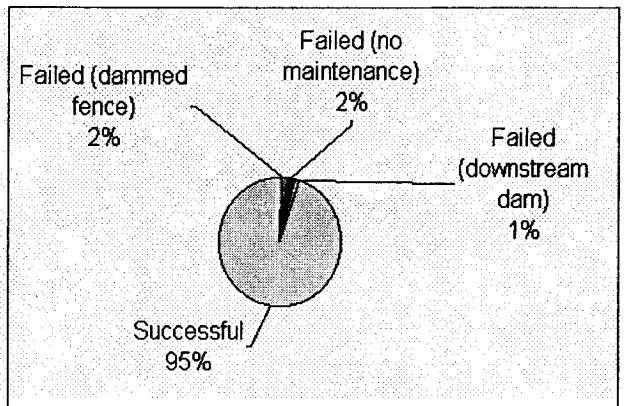

FIGURE 4
CULVERT PROTECTION RESULTS

SUMMARY

Beavers and humans can coexist. This study strongly supports the assertion that properly designed and installed flow devices are cost-effective, long-term tools to manage beaver-related conflicts with humans. While flow devices do not eliminate the need for trapping some beaver colonies, this study indicates that the devices should be a primary beaver management tools to cost-effectively resolve most beaver conflicts and maximize wetland acreage.

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